

# POPULAR Computing WEEKLY

9 September 1982 Vol 1 No 21

35p

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the Jupiter Ace

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Spectrum stock control

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**How to submit articles**

Articles which are submitted for publication  
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All submissions should be typed and a double  
space should be left between each line.

Programs should, whenever possible, be  
computer printed.

At present we cannot guarantee to return  
every submitted article, so please keep a copy.

**Accuracy**

Popular Computing Weekly cannot accept any  
responsibility for any errors in programs we  
publish, although we will always try our best to  
make sure programs work.

## This Week



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## Editorial

The Jupiter Ace, launched last month, is a new kind of low cost micro. Designed by Richard Altwasser and Steve Vickers, the team responsible for Sinclair's ZX Spectrum, the Jupiter Ace consists of a Z80A microprocessor complete with 8K ROM, 3K RAM and 32 x 24 display.

But, while the hardware is fairly standard, the software is decidedly different. The Jupiter Ace is the first micro to use Forth. Almost every other micro on the market uses some form of Basic.

Forth was invented by Charles Moore and Elizabeth Rutherford at the US National Radio Astronomy Observatory in the early 1970s. It is much faster than Basic and takes up far less memory. Supporters of Forth also claim it is easier to learn than Basic.

Calculator enthusiasts, who should be familiar with Reverse Polish Notation, will find little difficulty in coming to grips with the Jupiter Ace. Micro users, who have already learnt to program in Basic, may find it harder to deal with Forth.

Whatever your views on Forth, Altwasser and Vickers should be congratulated for trying something new. I just wish the Jupiter Ace was colour instead of black and white.

## Next Week



Can you save your  
city from the mutant bees?  
Find out in *Swarm*, a new game  
for Spectrum.



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**FULLER FD SYSTEM**

# Christmas launch for Commodore Max

THE new Commodore Max is to be launched in the UK just before Christmas.

Features will include a 66-key keyboard, complete with four programmable function keys, direct audio and video output and a built-in RF modulator. Twin control ports will allow the use of two joysticks, four paddles or a lightpen.

There is a cartridge slot for games. The Max cartridges will be compatible with the Commodore 64 (reviewed in *Popular Computing Weekly*, September 2).

A mini Basic cartridge option will enable users to write their own programs.

The Commodore Max (formerly called the Vic10 and the Ultimax) has 2K internal memory and a 40 column x 25



Commodore Max.

line display. There are 16 colours, which can be used simultaneously on-screen. Graphics resolution is 320 x 200 pixels.

The Max's sound consists of three independent voices of nine octaves each. There is an envelope generator, a programmable filter and master resonance and volume controls.

The Commodore Max will have a recommended retail price of £110 including VAT.

## Panasonic to launch handheld computer in UK

PANASONIC is to launch the RL-H1000 hand held computer in the UK next spring.

The primary unit of the system is based around a 6502 processor with 16K Rom and either 4K or 8K Ram. It also features a built-in 26 character liquid crystal display.

The main advantage of the microcomputer is its size. The primary unit is 9in x 2 1/2in x 3 1/2in and weighs just over 1 1/4lb.

It is powered by five nickel-cadmium rechargeable batteries.

## Prestel to give away free adaptors

PRESTEL hopes to give away 100,000 free adaptors, to encourage more home tv owners to use its services. The scheme, which is known as Project Y, will be carried out in collaboration with an unnamed financial institution.

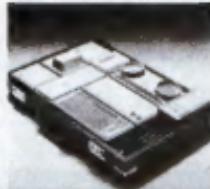
The Prestel adaptors will be offered to the institution's existing customers as part of a package deal.

ies. Mains operation is also possible using an AC adaptor.

The range of peripherals that will be available with the machine includes I/O adaptor, RS232C interface, acoustic modem, tv adaptor and a programmable memory expansion protected by its own back-up battery.

All of these accessories, together with the primary unit, can be fitted inside a specially converted attache case.

The RL-H1000 hand held computer has been on sale in the US since January this year. Current American prices for the primary unit are £225 and £280 for the 4K and 8K versions with peripherals costing between £60 and £200.



Panasonic's handheld micro.

## The age of the game

IT is now possible to annihilate space invaders between London and Scotland.

In an experiment being conducted by British Rail, selected trains from Euston to Inverness will carry a Space Invaders machine along with the sandwiches in the buffet car.

The machines have been supplied by Bell Fruit (UK) Ltd and have been installed with the help of area maintenance staff at British Rail's Derby engineering works.

Introduction of the machines was the idea of Peter Dunkerley, a member of BR's Transport Technology Assessment Group. He says "We investigate all kinds of new

technology which may be adapted to increase BR's passenger and freight revenue. The Space Invaders project started following a brainstorming session."

If the scheme is successful the idea may be extended to other long-distance services.



Aliens from Inverness.

## Speculation over IBM's Greenock plant

THERE is increasing speculation that IBM's Personal Computer will be produced at its Greenock plant in Scotland.

The IBM Personal Computer, which costs £888, was launched in the US in August 1981. It has yet to be released in the UK, though a limited number of machines have been imported by companies such as KGB Micros.



IBM's Personal Computer launched in the US.

## Lynx micro from Computers

THE Lynx, a new micro from Cambridge-based Computers Ltd, will be shown publicly for the first time at the *Personal Computer World* show in September.

The new micro will cost £50 plus VAT. It includes 48K Ram, an integral power supply and a typewriter-style keyboard. Other features in-

clude high resolution colour graphics and a built-in speaker.

A complete Lynx system, with disc drives and printer, will be on display at the Lynx stand — No 269 — from September 9-12.

More information from Computers Ltd, 36a Hills Road, Cambridge CB2 1LA.

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	Ship of the Line 16K	£3.95
	Fruit Machine/Sub	£3.95
	Cash Control	£8.50
	Monster Mine	£4.25

Total £

I enclose a cheque, made payable to Popular Computing Weekly Discount Club, for £.....

Name.....

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Send this order form to Popular Computing Weekly, Discount Club, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

# Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

## Riding the gravy train

I enjoyed Jeremy Ruston's "Voyager" program in the July 22 issue, but the message "You missed — see you in 30 light years" is bad enough to be a quote from Star Wars. As anyone who has ever picked up a physics text book (or watched Star Trek for that matter) could tell you, a light year is a measurement of distance.

Also, why our frozen food should go off because we went fast is beyond me. Might I suggest that the fuel ran out first.

I also enjoyed Reverse by Mike Berry. I hope you can continue the standard.

Peter Greenall  
Leicester

## Or hitching with the dragon?

It surprised me after reading your review of the Dragon 32 and associated comments and letters from your readers, that no one has spotted one essential fact. The Dragon is not only in direct competition with the Tandy Colour Computer, it also consists of exactly the same technology, with very few exceptions.

The 16K extended Microsoft Basic, with its special commands for 256x192 graphics and one channel sound, is to the byte the same as used on the pre-existing Tandy. The low quality screen display and Rom port are also reminders of that machine.

I owned a Colour Computer for some eleven months and found it to be under-supported and of low quality components ie. clickity-clackity keyboard and no parallel port. When I moved here from the US, I sold it at a loss and chose what to me seemed to be a high quality machine with future options for expansion — the BBC model B. Now I see that the ghost of my former computer, albeit with a fairly good keyboard and Centronics port, has followed me over the Atlantic.

PS if the Rom port is the same as the Tandy, and I see no reason why it would not be, then Dragon owners will find there is a ready bank of software at their nearest Tandy dealer.

William Barnes  
5 Shaftesbury Villas  
Alles Street  
London W8

## Spectrum bugs wanted

Paul Harrison in this column (August 12) reported a 'bug' in his Spectrum — well, all of the presently available machines have it and more!

Paul noticed that if the 'cursor-line' was set to 'one after' the last line of a program then the edit key give an edit-line containing a 'cursor'. His example was to 'enter':

100 PRINT — ENTER  
101 — ENTER  
EDIT

and line 100 would be brought down with the 'cursor' (but not when using 255 and 256). So what is happening?

In the above case, the 'cursor-line' is 100 when the first Enter is keyed. It becomes 101 when the second Enter is keyed but when Edit is used there is no line 101 and the last line of the program, ie 100, is called down.

Now for the problem. The programmer of the Rom decided that Edit lines shall not have a 'cursor'. He says that before printing an Edit line the system variable E-PPC, that holds the cursor line number, will be decremented — but he forgot that the last line of the program might have a line number that is 'E-PPC — 1'. Hence on those special occasions a 'cursor' is printed.

The solution is probably quite simple — change the instruction line at OFDE from Call 1855 to Call 1860.

And for two further bugs. Try replying to 'scroll?' with 'caps lock', 'graphics', or 'shift & symbol shift'. The results are interesting and it is most surprising that the Spectrum does not crash.

The other bug is to ponder over why 'Int - 65536 = -1'. No doubt other 'bugs' will

appear and I would very much like to hear about them.

Ian Logan  
24 Nurses Lane  
Skellingthorpe  
Lincoln LN6 5TT

## Time gentlemen — please

My Spectrum has been on Morder from Sinclair for eight weeks now. Having contacted them recently, I am informed that rumours of the backlog being eliminated are "greatly exaggerated". How much longer must I wait, I wonder.

When my Spectrum does arrive, however, I would like to know what amendments I will need to make to the numerous programs I have collected for the ZX81 so that they will run on the Spectrum. I have not seen this aspect of upgrading mentioned or dealt with in any magazine. Can you help?

B Davies  
2 Juniper Crescent  
Apsey Park  
Longthorpe  
Peterborough PE3 6QY

Most ZX81 Basic programs will run on the Spectrum with little or no modification. But, you will have to add your own commands to take advantage of the Spectrum's colour and sound facilities.

The simplest solution may be to use East London Robotics' Slewloader, which allows ZX81 software to run on the Spectrum. It costs about £10 and is available from East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London E6.

## Cut-outs — the moaning

I am writing to make some constructive criticism, not just complain.

I have found myself in agreement with your editors and they have provided inspiration on many occasions. However, your editorial of July 29 exaggerated me.

Motivated by a previous editorial extolling the virtues of machine code, I attempted

to develop my limited skills by writing a machine code program of my own. But, before I could send it off in all its glory for your hoped for approval, I read "Moonlander, Space Invader and Fruit Machine programs abound". My program was a version of Fruit Machine. Oh Well!

Having my work accepted is a great boost to my enthusiasm. Please encourage us, but be tolerant when we use an "oldie" idea to try and improve our skills. Soon, I hope, both my skills and my ideas will be increased.

Second moan. Could you print cut-out forms and competition entries on the back of advertising pages. I do not want to enter the "Spectrum" competition as it would mean losing large sections of articles that I wish to keep for future reference. Likewise your Reader Survey.

When you began, you ran competitions on a theme. Could you not repeat this, perhaps on a monthly basis? Then you could print two or three of the best entries in future issues. This would give us some motivation, even if the only "prize" was possible publication.

Ray Elder  
1 Periton Court  
Parkhouse Road  
Minehead  
Somerset

We do try and print cut-out forms on the back of advertising pages, but the exigencies of production are such that it is not always possible. As for theme competitions, please write in and let us know your views.

## On-screen Images

After typing in the short machine code routine in the Instant screen article in July 1, I noticed that changing JE in byte 16526 to C6 produced an inverse image of the screen. All the information in table 1 still applies to the routine.

Patrick Budden  
Wolfraton  
Dorchester DT2 9QN

# COVER STORY

## Pteragon

A new game for BBC micro by A Snail

The sudden insistent beep of the search radar alarm breaks the silence in the cockpit of the solar-powered skimmer. As a newcomer to the Planetary Defence Force, you tense to full alertness — this is your first mission.

The recently established colony on the planet Beta Strigidae has been under attack from huge winged reptiles — the semi-sentient Pteragon. Your task is to destroy the incoming waves of monsters before they reach the settlements. Each member of the PDF must deal with five of the creatures in each attack, and there is intense competition within the force to shoot them down in as short a time as possible.

The sound of powerful wingbeats can be heard as the first of the Pteragon comes into view through your craft's forward ports, you must manoeuvre quickly to frame the monster in your sights before it flies past. The 'A' and 'Z' keys move the skimmer up and down, and the '>' and '<' keys move you right and left. The space bar fires your energy beam weapon, and if you are a good shot will vaporise the Pteragon.

If the Pteragon moves out of your field of view for too long, you will lose it and incur a time penalty. The score shown on your display is the time taken to shoot down the number of Pteragon shown in the HITS column, plus any time penalties for missed monsters. RECORD gives the fastest time achieved so far — the time that you must beat.

This program has been especially written for the BBC micro, and makes use of many of the advanced sound and graphics features of this machine. It will run on a model B, or on a model A with 32K of memory.

A look at the program listing will show that it has been written almost entirely as a set of procedures, and hence should be very easy to follow. Of special interest is the simple procedure to draw the Pteragon, at line 2000. This makes use of the PLOT 86 statement, which plots using the logical inverse colour. It enables the creature to move behind the foreground features on the screen by an appropriate choice of colour definitions in the initialisation procedure at line 5000.

If a longer game is required, the number of Pteragon to be shot down can be increased by changing the limit in line 50. The procedure called 'rules' at line 4500 has been left out of this listing to keep the length down, but can easily be written in to give a brief description of the operation of the controls before the game starts.

This program has also been successfully run using joysticks on the model B. Lines 550-570 are replaced by:

```
550 P=ADVAL(9)
551 IF P=1 THEN PROCfire
552 IF TIME>T1+150 THEN PROCchase
and the procedure at line 4000 becomes:
4000 DEF PROCchase
4010 X=X+36-INT(ADVAL(2)/999)
4020 Y=Y+36-INT(ADVAL(1)/999)
4030 ENDPROC
```





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Cheques and postal orders should be made out to *Popular Computing Weekly*. Your advertisement should arrive at least two weeks before the publication date.

If you have any queries regarding Classified or semi-display advertising please call Alastair Macintosh on 01-930 3840

**Popular Computing Weekly.**  
The fast one.

# Street Life

## Oversize aquatic horror fitted with remote control

**David Kelly** talks to Uvatech about a rival to *Jaws*.

If only Stephen Spielberg had known what he was starting when he filmed *Jaws*.

Ever since the killer fish made its debut, the screens have been filled with a succession of sharks, whales, squids, piranhas and even a deadly beach ('just when you thought it was safe to go back in the water, you can't even get across the beach').

Now *The Pike* is planned — featuring a 12 ft-long micro-controlled monster. Providing the £2.5m budget can be raised, the film should go into production later this year, for release in 1983.

Work on the giant fish, controlled by an Acorn Atom, has been completed and the creature is undergoing 'sea' trials.

The huge man-eating pike has been designed and built by Uvatech Ltd. Based in Ulverston, Cumbria, the four-year old company was formed by several former employees of Vickers Oceanic.

George Colquhoun, the company's managing director explained that Uvatech specialises in underwater remote control devices and sonar equipment. Its most successful product is a scanning profiler which produces sea-bed cross-sections using a device incorporating a 6502 processor on the sea floor coupled to an LSI 11 surface computer.

It was on the strength of this device that

the Manchester-based film company, City Major, commissioned Uvatech to build the giant pike.

Building the over-size aquatic horror was not easy. The basic design was produced by Uvatech but the body of the fish was sculpted by Manchester artist Charles Wyllie.

To aid in the design, two live captive pike were studied and their movements video-taped to discover the secrets of their swimming action.

From the outside, the Uvatech pike is indistinguishable from the real thing only by its size.

The pike has been designed to swim under its own power. The tail and body of the 600lb model bend back and forth to propel it through the water. The motive force comes from a pneumatic system powered by compressed air containers inside the fish.

Christopher Edwards, Uvatech's electronics expert, explained how the Acorn Atom is used to control the pike.

"We fitted one of Acorn's versatile interface boards to the Atom and used the 20mA serial output.

"The micro regularly sends an eight-line data bus to each address on the pike. The tail, body, rear fins, front fins, jaw and eyes can all be controlled."

There are 16 possible positions for each part of the fish. The control information is passed from the computer to the fish

through a thin umbilical wire. Of the eight data lines, four are used to show the address and four are used to set the position of that address.

The feedback output from each part of the pike is converted from analogue to digital. It is continuously matched in a central asynchronous decoder with the corresponding input from the micro.

Thus the positions of each part of the fish are updated eight times each second using information from the microcomputer.

Before the pike can be made to swim, the Atom generates a data table. Amplitude values are then picked off this table, held in RAM by the computer, and sent to the fish to produce the swimming movements.

"Obviously" said Christopher "it is a fairly unsophisticated data bank but, since each part of the fish can only register 16 positions, a more accurate system was unnecessary."

"We started the electronics part of the pike in January. The whole fish was completed and tested in our tank in May."

Since then the pike has undergone successful trials on Lake Windermere. According to Christopher Edwards the fish cost about £30,000 to make.

He says "It was great to work on. If we were rich we could afford to play with it to our heart's content."

The giant pike is currently residing in Uvatech's warehouse, waiting for City Major to begin filming.

### Errata

Jonathan Briggs is not forming a North-west London Spectrum User Group (Populer Computing Weekly, August 18). Please do not attempt to contact him.

Joan Collins (right), examining the giant Pike (left), whose exterior skin was constructed using a special tear-resistant silicon rubber reinforced with cotton muslin.



Copyright Lakeland Photographic, Kendal, Cumbria.

# Jupiter Ace makes Forth bid for stardom

**Boris Allan** presents the first review of the new Jupiter Ace and explains its use of the language Forth.

The Jupiter Ace is a microcomputer from two leading designers of the Sinclair Spectrum (Richard Altwasser and Steve Vickers). The Ace is based on the Z80A microprocessor, with 8K bytes of Rom and 3K bytes of Ram; has a Spectrum-style keyboard (though it is promised to be more positive); has a proper memory-mapped screen (unlike the Spectrum), with a 32 x 24 display on an ordinary television; and has sound and cassette facilities similar to those of the Spectrum, but no colour. It costs £89.95.

If the Ace sounds like a Spectrum under a different cover, it is not. The Ace is set apart from the Spectrum, and all other small microcomputers, by the use of the programming language Forth alone.

To emphasise, you cannot program the Ace in Basic, you have to use this rather different language Forth. Though it is an uncommon language, many people have recently become interested in Forth, and versions have appeared inter alia for the Atom, ZX81, MZ80K, BBC computer, and there is Forth available on the latest version of the Osborne 1.

For Forth to appear on the Osborne (a business machine) implies that this is a language which is beginning to make commercial sense.

When confronted with a machine with higher resolution graphics, and a claim from its designers that "Ace is ideal for games", the question is "why Forth and not Basic? Is Forth an easy language for beginners?"

In a way some people are afraid of Forth — a fear of the unknown? — as it seems

unnatural to type in

2 5 +

when you really mean

2 + 5

If I ask you to add 2 and 5, you answer 7; if I ask you will take 2 and 5 and add them together, you will still answer 7. When you add two numbers you are doing something to those two numbers to produce a result (another number). In Forth it is clear you are doing something to numbers, to produce another number.

Forth says here are two numbers, add them together; 2 and 5 are the numbers, and + means add them together

2 5 +

It's not all that strange really.

What is Forth? In essence Forth is a computer language which is truly interactive (almost as if it were a Basic in instant mode all the time), and it is a language which is truly extensible.

In Basic it is possible to add new functions and procedures, but very difficult to add new commands unless one uses machine code routines.

Forth is a very efficient language, much speedier than most Basics. The 8K of Rom in the Ace corresponds to a far greater amount of Rom for any Basic, and the 3K of Ram is worth more than 3K of Ram if

# Reviews



used by a Basic program.

The version of Forth used by the Ace is based, loosely, on two standards, FIG-Forth (Forth Interest Group) and Forth-79, but with important modifications. All the modifications seem to be improvements. I will examine some of them in more detail after I have looked at more general features, common to most Forths.

Forth is most notable for the way in which it uses basic functions (or procedures) to produce more powerful functions, so that, finally, the whole program (or 'application') is just one all-embracing function (or 'word').

Forth also uses a stack, and the user can control what happens on the stack. Think of the stack as a pile of numbers, on which you can put more numbers or take numbers off, but at one end only.

Suppose I want to multiply two numbers together. In Forth I say "here are two numbers, multiply them together"

2 5 \*

and this line means take the numbers 2 and 5, multiply them together, and finally print out the result (which is what the '\*' means).

Forth copes with this line by starting at the left, and moving right. The first item encountered is "2" and this is recognised as a number. The number 2 is "stacked" for later use. The second item is "5". This is a number and is stacked on top of the 2, for later use. When the program meets the word '\*' it knows that this means multiply. It multiplies the two numbers on the top of the stack (ie 2 and 5), so removes them and places the answer on top. When the word '\*' is met it is understood to mean print the value of the number on top of the stack and remove the number.

The word '\*' is not very self-explanatory, but in Forth if you do not like the name of a function/word you can change it, eg:

: PRINT : CR :

and now the word "Print" means do '\*' and then carriage return ("Cr"). The sum now looks like

2 5 PRINT

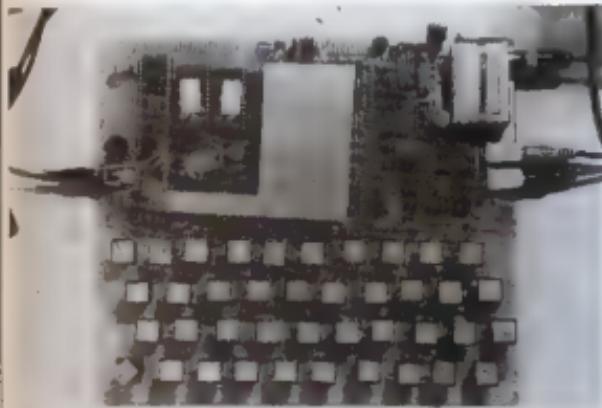
and it is possible to continue.

It would be nice to find the square of the number 7, and it could be done by

7 7 \* PRINT

or, possibly

7 DUP \* PRINT



Interior layout of a pre-production model of the Jupiter Ace.

where the word "Dup" means take the number on top of the stack (in this case 7) and put another copy on top of it (Duplicate). It would be nice to do this by just saying:

#### 7 SQUARED

and one can say

: SQUARED DUP \* PRINT;  
which is a 'colon' of the word "Squared", which definition uses a word "PRINT" defined earlier. And so the process can continue.

In normal Forths editing words and

Vickers version of Forth (eg Redefine or Fast or Edit) which are worth incorporating in other versions.

I have found that Forth on micro-computers is not (generally speaking) user friendly — on most systems it is only too easy to find oneself in a situation where the only thing one can do is switch off and reload the Forth system. The Ace system is user-friendly, and difficult to crash.

The question of how user-friendly is the Ace is important because, being aimed, as it is, at the cheap end of the market and

applications and applications, often this will not be necessary. As Forth itself is in ROM, if the system does crash — Steve Vickers and I had great difficulty in performing this test — if it does crash, Forth is not lost.

For a beginner, I do not think that Forth is intrinsically any more difficult to learn than Basic. If it is approached in the right manner, but even if it is not more difficult, is it any better? Altwasser and Vickers are, I believe, sincere in their belief that Forth is intrinsically a better language, and in one sense I agree. Forth is better because as we have seen it is possible (once the groundwork has been done) to perform complicated operations with a minimum of programming. Some of the queries come with "once the groundwork has been done".

The word "Squared" used another word "Print" and another word might use them both, but "Squared" could not use "Print" until we had defined "Print"; though with Ace Forth it is possible to give a dummy definition to "Print" (eg : PRINT;) and then later use "Redefine" to give a proper definition. A possible problem with this approach (for novice and not so novice) is the "design at the keyboard" syndrome. That is, it is easy to get tied up in the minutiae and lose sight of the overall structure. This is also a problem with most other languages, whether they be called structured or not.

I have a feeling that the Ace might well find a market as a cheap way of learning Forth (schools, colleges, and businessmen?) for some, and for others a cheap way of obtaining a machine with the speed of Forth (not far slower than poorly written machine code) for control applications. For those who would like to use the Ace for control applications, the way in which the Ace talks to the world is obviously important. The Ace talks via the television, and a rear port — the one I saw connected to the Ram pack. Richard Altwasser told me that they planned to provide means of coupling up to all the main interfaces one would need for use in control applications.

Steve Vickers puts the Jupiter Ace's keyboard through its paces.

applications can be tedious (for reasons too tedious to explain) and the designers of the Ace had come to the same conclusion. In normal Forths it is possible to keep a copy of a definition on what is termed a 'screen', but once the definition has been compiled the internal workings cannot be changed. With the Ace there is no need to keep a separate copy of the listing of the definition — in fact one does not, in any case — and one can edit, list, and "Redefine" words (replace an earlier version of a word by the latest definition, and redefine any other definitions that are necessary).

Forths do not normally have floating point operations as part of the standard set of words, but the Ace has five special floating point words for use on six significant digits (1E84 to 1E-84). Ace Forth also has inbuilt array using features.

In many respects the Ace has many of the good features of the Spectrum, very good cassette saving, loading, and verifying, good line editing, good user defined graphics capabilities. As a way of using Forth, it is excellent. Apart from these resemblances, the Ace is a very different machine because it is in black and white (though a colour facility is being considered), and it can use the ZX81 16K Ram pack (plus many of the other ZX81 add-ons). An easy machine to use.

Though the machine I used was not the final production version I have no doubts about the eventual production machine. I am sure that as a Forth machine it will be excellent. I think that given my use of Forth on the Ace there are many ideas in Steve

competing with cheaper black and white computers, and slightly more expensive colour computers, and as it uses what is a novel language, the Ace has to be user-friendly to succeed. Once one has the dictionary of words — tailored to one's own interest — to create sophisticated applications should not be as difficult as creating large programs in Basic. One word can stand for a program or a standard (often complex) facility.

Though it is possible to merge dictio-



Richard Altwasser "providing the Ace with interfaces for use in control applications".

# Open Forum

Open Forum is for you to publish your programs and ideas.

It is important that your programs are bug free before you send them in. We cannot test all of them.

Contributions should be sent to: Popular Computing Weekly, Hobhouse Court,  
19 Whitcomb Street, London WC2H 7HF.

## How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs.  
(The usual fee is £10.)

### Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

## Roman Numerals Converter

on ZX81

Roman numerals are found in the flyleaves of old books and on many old films, as well as on stones of old buildings and so on. In these contexts, they usually represent dates.

These strings of letters are often confusing and difficult to interpret. This following program interprets them for you. In addition, it will also convert any decimal number from 1 through 4999 to Roman numerals.

### Program notes

Lines

```
90 LET PR=“00MVL0”
110 LET XS=“”
120 INPUT AS
130 IF AS=“STOP” THEN STOP
140 SCROLL
150 PRINT AS
```

```
160 IF AS>“1A” THEN GOTO 389
170 FOR J=1 TO LEN AS
180 LET YS=“”
190 LET A=VAL AS(LEN AS-J+1)
200 IF A>3 OR A=9 THEN LET YS=Ys+PR(J)
210 IF A=3 THEN GOTO 289
220 LET A=A-1
230 IF A>9 THEN GOTO 299
240 LET XS=YS+XS
250 NEXT J
260 PRINT XS
270 GOTO 199
280 IF A=9 THEN GOTO 309
290 IF J=4 THEN GOTO 229
300 LET YS=YS+PR(J+4)
310 LET A=A-5
320 GOTO 239
330 LET YS=YS+PR(J+1)
340 GOTO 249
350 IF A<“C” THEN GOTO 199
360 LET I=1
370 LET V=5
380 LET X=10
390 LET L=54
400 LET C=199
410 LET D=399
420 LET M=1399
430 LET T=0
440 FOR J=2 TO LEN AS
450 LET B=VAL AS(J-1)
460 LET E=VAL AS(J)
470 IF E>B THEN GOTO 559
480 LET T=T+B
490 NEXT J
500 LET T=VAL AS(LEN AS)+T
510 PRINT T
520 GOTO 199
530 FOR J=1 TO 1 STEP -1
540 IF AS(J)> AS(J-1), THEN GOTO 489
550 LET T=VAL AS(J)
560 LET T=T-2*E
570 NEXT K
580 GOTO 489
```

To operate this program, Run, and enter either:

- i) a decimal number (not exceeding 4999) for conversion to Roman numerals, or
- ii) a Roman numeral (not exceeding MMMMMCMXCIX) for conversion to decimal.

Press newline. The number you entered is displayed on the left, the conversion on the right.

## ZX Artist

on ZX81

This art program gives the user all the usual things other art programs give plus the facility to draw a straight line from one

given point to another, draw a circle and provide the co-ordinates for plotting.

The program also incorporates one point plotting, the ability to draw lines using the cursor keys, copy pictures on to the printer and store pictures on tape.

When the program is Run the user is given the choice of 10 options to choose from.

Option “0” will first ask the user for a starting point (X and Y co-ordinates) and then hand control over to the user with the cursor keys.

### Option selection

The user can leave this part of the program any time and return to the option section of the program by pressing the “9” key.

Option “1” will ask for co-ordinates and plot a single pixel on that point.

Option “2” will ask for co-ordinates and unplot a single pixel on that point.

Option “3” will ask for starting co-ordinates and finishing co-ordinates and will plot a line between them.

Option “4” will do the same as option “3” but will unplot a line between the co-ordinates.

Option “5” will ask for X and Y co-ordinates and a radius. It will then ask for how much of a circle the user wants by using the numbers 0-40, 0-10 will plot the first quarter of a circle, 10-20 the second etc. 0-20 would plot the first half of the circle.

Option “6” does the same as option “5” but unplots the circle.

Option “7” copies the border and its contents on to the printer.

Option “8” saves the program and the screen on to tape.

Option “9” stops the program.

### Program notes

Lines

```
18-199 set up the screen.
199-200 sort out the options.
200-279 provide option “0”.
299-1199 provide option “1”.
2999-2019 provide option “2”.
3099-3219 provide option “3”.
4999-4919 provide option “4”.
5899-5199 provide option “5”.
6999-6919 provide option “6”.
7999-7179 provide option “7”.
8999-8949 save the program and screen.
9999 slope the program.
```







# Open Forum

from previous page

```

890PROCSCORE
900BSOUND0, 2, 4, 10:MOVEXX+PxX, YY+PyY
910PROCLASH(17, 32)
920VDU9, 127, 127, 11, 9, 9, 127, 127, 9, 10
930DX=XX+PxX:DY=YY+PyY:FORVX=1TO3:IFPX(VX, 0)>UX-B0 ANDPX(VX, 0)<UX+B0 ANDPX(VX, 1)>UY-B0 ANDPX(VX, 1)<UY+B0:PX(VX, 0)=RND(1280):PY(VX, 1)=RND(1024)
X, 1):ANDPX(VX, 0)<UX+B0:PX(VX, 0)=RND(1280):PY(VX, 1)=RND(1024)
940NEXTVX
950PROCLASH(3, 32)
960ENDPROC
970DEFPROCMDOV
980FORJX=1TO3:MOVEPX(JX, 0), PY(JX, 1):VDU9, 127
990FORKX=0TO1:PX(JX, KX)=PX(JX, KX)+RND(50)-RND(50):IFPX(JX, KX)>1000 OR PX(JX, KX)
X<0 PX(JX, KX)=500
1000DX=XTX:IFPX(JX, 0)>XX+30 ANDPX(JX, 0)<XX+30 ANDPX(JX, 1)>YX+30 ANDPX(JX, 1)<YX+
30 PROCMDUC
1010MOVEPX(JX, 0), PY(JX, 1):VDU224
1020NEXTJX
1030ENDPROC
1040DEFPROCNUCLX=LX-1
1050PROCSCORE
1060BSOUND0, 2, 6, 10
1070MOVEVX, YX
1080PROCLASH(17, 400):PROCLASH(3, 400)
1090ENDPROC
1100DEFPROCFLASH(D, L)
1110PLOTD, 0, L:PLUTO, 0, -L:PLOTO, L, L:PLOTO, -L, -L:PLOTO, L, 0:PLUTO, -L, 0:PLOTO, L, -L:
PLUTO, -L, L:PLOTO, -L, 0:PLUTO, L, 0:PLOTO, -L, -L:PLUTO, L, L:PLOTO, -L, 0:PLUTO, L, 0:PLOTO
+L, 1:PLUTO, L, -L
1120ENDPROC
1130DEFPROCSCORE
1140VDU4, 30:PRINT"SCORE ", HX$0+HX TAB(1B), "SHOTS ", IS TAB(2B), "LIVES ", LX" ":
VDUS
1150ENDPROC

```

PROGRAM OF THE WEEK

Tri-oids  
by John Murphy

## Pucman

ON VIC-20

This program is entitled Vic Pucman and it runs on the unexpanded 3.5K Vic. The variables list is as follows:  
 Z — is the position of you.  
 Q — is the position of the computer.  
 OO — is the number of dots which have been eaten.  
 SC — is your score.  
 HS — is the high score.  
 S — is the music variable.  
 XC — is the second highest score.  
 NAS — is the name of the person who has the high score.

The program is based on the popular game Pucman, where a ghost chases you round a maze of dots and circles.

In my version the 'O' gives you 50 points and the '-' gives you 10 points. When the maze has been cleared your score, if bigger than the high score, is recorded.

### Program notes

Line 100 Set up variables.  
 10-75 Draw the maze.  
 80-130 Decide which way you move.  
 151-152 Decide where computer moves.  
 600-700 Decide whether you have crawled into the wall of the maze or not, also how much you score.  
 800-850 Decide whether the computer has crawled into the wall or not and count the number of dots that have been eaten.  
 1999-1958 Play a turn.  
 1955-2110 Show the high score when the game is over and tell you that you have lost.  
 2999-3229 Input the high scorer's name.  
 6999-6958 Are the instructions and titles.

```

8 Z=23:0=413:POKE36878,15:POKE86609:POKE558,129
1 PRINT"2":Z=22:0=26:POKE36878,15:RESTORE 5C=81:0=8B
2 POKE36879,8:PRINT"3"
5 PRINT"4"
10 PRINT"5"
20 PRINT"6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299,290,291,292,293,294,295,296,297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,490,491,492,493,494,495,496,497,498,499,500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,568,569,560,561,562,563,564,565,566,567,568,569,570,571,572,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588,589,580,581,582,583,584,585,586,587,588,589,590,591,592,593,594,595,596,597,598,599,590,591,592,593,594,595,596,597,598,599,600,601,602,603,604,605,606,607,608,609,610,611,612,613,614,615,616,617,618,619,620,621,622,623,624,625,626,627,628,629,630,631,632,633,634,635,636,637,638,639,640,641,642,643,644,645,646,647,648,649,650,651,652,653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668,669,660,661,662,663,664,665,666,667,668,669,670,671,672,673,674,675,676,677,678,679,680,681,682,683,684,685,686,687,688,689,680,681,682,683,684,685,686,687,688,689,690,691,692,693,694,695,696,697,698,699,690,691,692,693,694,695,696,697,698,699,700,701,702,703,704,705,706,707,708,709,710,711,712,713,714,715,716,717,718,719,720,721,722,723,724,725,726,727,728,729,730,731,732,733,734,735,736,737,738,739,740,741,742,743,744,745,746,747,748,749,750,751,752,753,754,755,756,757,758,759,760,761,762,763,764,765,766,767,768,769,760,761,762,763,764,765,766,767,768,769,770,771,772,773,774,775,776,777,778,779,780,781,782,783,784,785,786,787,788,789,780,781,782,783,784,785,786,787,788,789,790,791,792,793,794,795,796,797,798,799,790,791,792,793,794,795,796,797,798,799,800,801,802,803,804,805,806,807,808,809,810,811,812,813,814,815,816,817,818,819,820,821,822,823,824,825,826,827,828,829,830,831,832,833,834,835,836,837,838,839,840,841,842,843,844,845,846,847,848,849,850,851,852,853,854,855,856,857,858,859,860,861,862,863,864,865,866,867,868,869,860,861,862,863,864,865,866,867,868,869,870,871,872,873,874,875,876,877,878,879,880,881,882,883,884,885,886,887,888,889,880,881,882,883,884,885,886,887,888,889,890,891,892,893,894,895,896,897,898,899,890,891,892,893,894,895,896,897,898,899,900,901,902,903,904,905,906,907,908,909,910,911,912,913,914,915,916,917,918,919,920,921,922,923,924,925,926,927,928,929,930,931,932,933,934,935,936,937,938,939,940,941,942,943,944,945,946,947,948,949,950,951,952,953,954,955,956,957,958,959,960,961,962,963,964,965,966,967,968,969,960,961,962,963,964,965,966,967,968,969,970,971,972,973,974,975,976,977,978,979,980,981,982,983,984,985,986,987,988,989,980,981,982,983,984,985,986,987,988,989,990,991,992,993,994,995,996,997,998,999,990,991,992,993,994,995,996,997,998,999,1000,1001,1002,1003,1004,1005,1006,1007,1008,1009,10010,10011,10012,10013,10014,10015,10016,10017,10018,10019,10010,10011,10012,10013,10014,10015,10016,10017,10018,10019,10020,10021,10022,10023,10024,10025,10026,10027,10028,10029,10020,10021,10022,10023,10024,10025,10026,10027,10028,10029,10030,10031,10032,10033,10034,10035,10036,10037,10038,10039,10030,10031,10032,10033,10034,10035,10036,10037,10038,10039,10040,10041,10042,10043,10044,10045,10046,10047,10048,10049,10040,10041,10042,10043,10044,10045,10046,10047,10048,10049,10050,10051,10052,10053,10054,10055,10056,10057,10058,10059,10050,10051,10052,10053,10054,10055,10056,10057,10058,10059,10060,10061,10062,10063,10064,10065,10066,10067,10068,10069,10060,10061,10062,10063,10064,10065,10066,10067,10068,10069,10070,10071,10072,10073,10074,10075,10076,10077,10078,10079,10070,10071,10072,10073,10074,10075,10076,10077,10078,10079,10080,10081,10082,10083,10084,10085,10086,10087,10088,10089,10080,10081,10082,10083,10084,10085,10086,10087,10088,10089,10090,10091,10092,10093,10094,10095,10096,10097,10098,10099,10090,10091,10092,10093,10094,10095,10096,10097,10098,10099,10100,10101,10102,10103,10104,10105,10106,10107,10108,10109,10100,10101,10102,10103,10104,10105,10106,10107,10108,10109,10110,10111,10112,10113,10114,10115,10116,10117,10118,10119,10110,10111,10112,10113,10114,10115,10116,10117,10118,10119,10120,10121,10122,10123,10124,10125,10126,10127,10128,10129,10120,10121,10122,10123,10124,10125,10126,10127,10128,10129,10130,10131,10132,10133,10134,10135,10136,10137,10138,10139,10130,10131,10132,10133,10134,10135,10136,10137,10138,10139,10140,10141,10142,10143,10144,10145,10146,10147,10148,10149,10140,10141,10142,10143,10144,10145,10146,10147,10148,10149,10150,10151,10152,10153,10154,10155,10156,10157,10158,10159,10150,10151,10152,10153,10154,10155,10156,10157,10158,10159,10160,10161,10162,10163,10164,10165,10166,10167,10168,10169,10160,10161,10162,10163,10164,10165,10166,10167,10168,10169,10170,10171,10172,10173,10174,10175,10176,10177,10178,10179,10170,10171,10172,10173,10174,10175,10176,10177,10178,10179,10180,10181,10182,10183,10184,10185,10186,10187,10188,10189,10180,10181,10182,10183,10184,10185,10186,10187,10188,10189,10190,10191,10192,10193,10194,10195,10196,10197,10198,10199,10190,10191,10192,10193,10194,10195,10196,10197,10198,10199,10200,10201,10202,10203,10204,10205,10206,10207,10208,10209,10200,10201,10202,10203,10204,10205,10206,10207,10208,10209,10210,10211,10212,10213,10214,10215,10216,10217,10218,10219,10210,10211,10212,10213,10214,10215,10216,10217,10218,10219,10220,10221,10222,10223,10224,10225,10226,10227,10228,10229,10220,10221,10222,10223,10224,10225,10226,10227,10228,10229,10230,10231,10232,10233,10234,10235,10236,10237,10238,10239,10230,10231,10232,10233,10234,10235,10236,10237,10238,10239,10240,10241,10242,10243,10244,10245,10246,10247,10248,10249,10240,10241,10242,10243,10244,10245,10246,10247,10248,10249,10250,10251,10252,10253,10254,10255,10256,10257,10258,10259,10250,10251,10252,10253,10254,10255,10256,10257,10258,10259,10260,10261,10262,10263,10264,10265,10266,10267,10268,10269,10260,10261,10262,10263,10264,10265,10266,10267,10268,10269,10270,10271,10272,10273,10274,10275,10276,10277,10278,10279,10270,10271,10272,10273,10274,10275,10276,10277,10278,10279,10280,10281,10282,10283,10284,10285,10286,10287,10288,10289,10280,10281,10282,10283,10284,10285,10286,10287,10288,10289,10290,10291,10292,10293,10294,10295,10296,10297,10298,10299,10290,10291,10292,10293,10294,10295,10296,10297,10298,10299,10300,10301,10302,10303,10304,10305,10306,10307,10308,10309,10300,10301,10302,10303,10304,10305,10306,10307,10308,10309,10310,10311,10312,10313,10314,10315,10316,10317,10318,10319,10310,10311,10312,10313,10314,10315,10316,10317,10318,10319,10320,10321,10322,10323,10324,10325,10326,10327,10328,10329,10320,10321,10322,10323,10324,10325,10326,10327,10328,10329,10330,10331,10332,10333,10334,10335,10336,10337,10338,10339,10330,10331,10332,10333,10334,10335,10336,10337,10338,10339,10340,10341,10342,10343,10344,10345,10346,10347,10348,10349,10340,10341,10342,10343,10344,10345,10346,10347,10348,10349,10350,10351,10352,10353,10354,10355,10356,10357,10358,10359,10350,10351,10352,10353,10354,10355,10356,10357,10358,10359,10360,10361,10362,10363,10364,10365,10366,10367,10368,10369,10360,10361,10362,10363,10364,10365,10366,10367,10368,10369,10370,10371,10372,10373,10374,10375,10376,10377,10378,10379,10370,10371,10372,10373,10374,10375,10376,10377,10378,10379,10380,10381,10382,10383,10384,10385,10386,10387,10388,10389,10380,10381,10382,10383,10384,10385,10386,10387,10388,10389,10390,10391,10392,10393,10394,10395,10396,10397,10398,10399,10390,10391,10392,10393,10394,10395,10396,10397,10398,10399,10400,10401,10402,10403,10404,10405,10406,10407,10408,10409,10400,10401,10402,10403,10404,10405,10406,10407,10408,10409,10410,10411,10412,10413,10414,10415,10416,10417,10418,10419,10410,10411,10412,10413,10414,10415,10416,10417,10418,10419,10420,10421,10422,10423,10424,10425,10426,10427,10428,10429,10420,10421,10422,10423,10424,10425,10426,10427,10428,10429,10430,10431,10432,10433,10434,10435,10436,10437,10438,10439,10430,10431,10432,10433,10434,10435,10436,10437,10438,10439,10440,10441,10442,10443,10444,10445,10446,10447,10448,10449,10440,10441,10442,10443,10444,10445,10446,10447,10448,10449,10450,10451,10452,10453,10454,10455,10456,10457,10458,10459,10450,10451,10452,10453,10454,10455,10456,10457,10458,10459,10460,10461,10462,10463,10464,10465,10466,10467,10468,10469,10460,10461,10462,10463,10464,10465,10466,10467,10468,10469,10470,10471,10472,10473,10474,10475,10476,10477,10478,10479,10470,10471,10472,10473,10474,10475,10476,10477,10478,10479,10480,10481,10482,10483,10484,10485,10486,10487,10488,10489,10480,10481,10482,10483,10484,10485,
```

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2

# Programming

## Automatic relocation subroutine

**Malcolm Peitz** presents a relocation program for the expanded Vic20.

This subroutine (Fig 1) will allow a program on Vic20, with 8K or more expansion, to relocate itself automatically beyond the user defined character set. The subroutine is self-contained.

Line 10 checks to see if the program has already been relocated or if it has any expansion memory in which to relocate. If the program has already been relocated it will not repeat the process. Lines 20-40 work out the last address of the program, while line 50 uses this last address to test whether or not there is sufficient memory available to relocate the program.

Lines 60-70 then move the program backwards, to avoid overwriting itself.

Lines 80-120 re-adjust the links used by Vic Basic and determine where the variables may start. Lines 130-160 Poke these values into the appropriate locations and set the new start of Basic.

Line 170 then runs the relocated program, which starts at line 200. This time the test at line 10 will be true and the Goto taken. Line 170 could read RUN 200 if you wish.

READY.

```
1 PRINT "PLEASE WRITE!!"
5 POKE56,30:POKE52,30:POKE644,30:POKE44,16
8 POKE642,16:POKE4096,0:CLR
10 FORI=7688T08191:POKEI,32:POKEI+38728,1:NEXT
20 POKE210,30:FORI=2177T0228:POKEI,159:NEXT
30 POKE229,159:POKE238,159:POKE231,31
40 FORI=232T0248:POKEI,159:NEXT
50 POKE244,151:POKE648,30
60 POKE36869,248:POKE36866,158
70 END
```

READY.

Fig 2

## Contact wear problem solved

**J S and J C Dale** explain how to run machine code games on an expanded Vic20.

After buying an expansion unit and a 16K Ram pack for my Vic, I was very disappointed when I found that I could no longer run my machine code games. The only way to run these games was to remove the Ram pack, but this wears down the contacts.

Under great pressure from my children, my eldest son and I, armed with Nick Hampshire's excellent book *The Vic Revisited*, set about solving this problem. The accompanying listing (Fig 2) is the result.

Before any game written for an unexpanded Vic is loaded, this program should be loaded and run. The relevant program may then be loaded and run without removing the Ram pack.

If you want to write a program immediately after running the conversion program, type in *New* before starting. Otherwise a *Syntax error* will result.

**Important** — After using the unexpanded program, ensure that you reset the Vic by typing *SYS54802* then press return.

```
10 IFPEEK(443)=360RPEEK(56)=32THEN200
20 A=PEEK(43)+256*PEEK(44):L0=A
30 IFPEEK(A)=0ANDPEEK(A+1)=0THEN50
40 A=PEEK(A)+256*PEEK(A+1):GOTO30
50 HI=A+1:IFHI+4609>PEEK(55)+256*PEEK(56)THEN
PRINT "NOT ENOUGH ROOM TO MOVE THIS PROGRAM":END
60 FORA=HI+1TOLO-1STEP-1
70 POKEA+4608,PEEK(A):NEXT:A=L0
80 IFPEEK(A+4608)=0ANDPEEK(A+4609)=0THEN120
90 POKEA+4609,PEEK(A+4609)+18
100 X=PEEK(A+4608):Y=PEEK(A+4609)
110 A=PEEK(A+4608)+256*PEEK(A+4609)-18:GOTO800
120 X-X+2:IFX>255THENX=X-255:Y=Y+1
130 POKE47,X:POKE48,Y
140 POKE45,X:POKE46,Y
150 POKE43,1:POKE44,36
160 RUN
200
```

Fig 1

## Spectrum

In this new slot various contributors explore different aspects of the ZX Spectrum.

This program was designed to be used by schools or small businesses, to keep track of used stock. It also enables you to quickly discover which items are in short supply and therefore need to be re-ordered. The suppliers reference number is also listed, to make re-ordering even easier.

Items can be altered, entered or deleted at will, as there is a comprehensive selection. After being entered, stock items can be altered as they are used by inputting the number of items used preceded by a minus sign.

A copy of the current stock position or of the items that need to be re-ordered, can be obtained with a printer using Copy. When a list is required of the final few items, is not a complete screenful, just press Break followed by Cts and Cont.

## Tracking down the missing supplies

**J Reynolds** stock control program keeps track of your business.

On the 16K Spectrum this program will hold 125 separate items. If more items are required, you can use separate tapes for different types of stock. For example, stationery could be kept on one tape and painting materials on another. Sasco Soft

index panels can be used to keep day to day track of stock levels so that information in the computer can be updated at weekly or monthly intervals.

In the event of any problems Goto 1000 will obtain the menu selection, so avoiding the loss of any variables which have been inputted.

### Program notes

Line 19 sets up the array.  
1993-1999: Menu selection.  
1999-1189: This is the area of the programme dealing

with the session.  
2000-2110: This part deals with alteration  
levels.  
3000-3048: Enters the stock.  
4000-4072: Lists the stock.  
5000-5048: Lists items to be re-ordered.  
6000: Serves and verifies.  
6000-6000: Purchasing function.

# Sound & vision

This program was written for the BBC micro, model A or B, and plays the musical game of Simon. The object of the game is to repeat the ever-increasing sequence of lights and tones by using the four cursor keys which correspond to the computer's coloured squares.

If you manage to reach your inputted skill level the computer will reward you with a warbling sound. Any mistakes and the game will end.

The program consists mainly of two For-next loops. The Y loop (line 200) controls the point in the sequence that you have successfully repeated. The X loop is used twice (line 210 and line 290) and runs from the beginning of the sequence to Y, controlling which light and tone is to be



## Simon says . . .

**L Raynor presents Simon,**  
*a musical game for the*  
**BBC model A or B.**

made. The pattern of the lights in the sequence is stored in the A array which is dimensioned (line 170) to store as many lights as the skill level you had previously entered.

The lighting up effect is made by changing the appropriate colour, determined by the number (1-4) in the array, to white and then back to its original colour, by the use of the VDU 18 command (lines 230, 250, 380 and 420). The Fx 4.2 command enables the cursor keys to be detected by an Inkey statement and the Fx 15.0 command clears the sound buffer.

One useful procedure is the ProcWait() one, which pauses for T milliseconds. I managed to reach a score of 14 — can anyone beat that?

```

10 REM*** SIMON BY L.M. RAYNER *
20 REM** FOR BBC MICRO MODEL A OR B ***
30 MODE 7
40 FOR X=1 TO 2:PRINTCHR$(141)CHR$(129)"           SIMON":NEXT X
50 PRINT"
60 PRINT CHR$(13):" REPEAT MY SEQUENCE OF SOUNDS AND"
70 PRINTCHR$(13)"COLOURS BY USING THE FOUR CURSOR KEYS"
80 PRINTCHR$(134)"WHICH CORRESPOND TO MY FOUR SQUARES."
90 INPUT"      SKILL? (10-30) "Z
100 IF Z<10 OR Z>30 THEN 90
110 *FX 4,2
120 MODE 8
130 FOR X=0 TO 3:VDU 19,Y,:+1=0,0:INEXT X
140 GCOL0+1:MOVE 640,512:MOVE 0,512:PL0T85+640,1 24:PL0T 85,0+1024
150 GCOL0+2:MOVE 640,512:MOVE 640,1024:PL0T 85,1280+512:PL0T 85,1280,
1024
160 GCOL0+3:MOVE 640,512:MOVE 640,0:PL0T 85+1280+512:PL0T 85+1280+0
170 DIM A(2)
180 FOR X=1 TO Z:A(X)=RND(4)-1:      50:GOTO 510
190 PROCWAIT(100)
200 FOR Y=1 TO Z
210 FOR X=1 TO Y
220 SOUND 1,-15,A(X)*20+30
230 VDU 19,A(X),7,0,0,0
240 PROCWAIT(50)
250 *FX 15,0
260 VDU 19,A(X),A(X)+1,0,0
270 PROCWAIT(50)
280 NEXT Y
290 FOR X=1 TO Y
300 A$=GETS
310 A=9
320 IF A$=CHR$(139) THEN A=0
330 IF A$=CHR$(136) THEN A=1
340 IF A$=CHR$(137) THEN A=2
350 IF A$=CHR$(138) THEN A=3
360 IF A=9 THEN 30
370 IF A(Y)<>A THEN SOUND 1,-15,1,1
380 SOUND 1,-5,A(X)*20+30
390 VDU 19,A(X),7,0,0,0
400 PROCWAIT(50)
410 *FX 15,0
420 VDU 19,A(X),A(Y)+1,0,0,0
430 PROCWAIT(50)
440 NEXT X
450 PROCWAIT(120)
460 NEXT Y
470 FOR R=1 TO 20
480 SOUND 1,-15,150,2
490 SOUND 1,-15,40,2
500 NEXT R
510 Colour 2:PRINT TAB(5,10)
520 PRINT"**PRES SPACE TO START"
530 A$=GETS:RUN
540 DEFPROCWAIT(T)
550 TIME=0
560 REPEAT UNTIL TIME>T
570 ENDPROC

```

# Peek & poke

Peek your problems to our address. Ian Beardmore will poke back an answer.

## ABOMINABLE CUSORS

**K V Jefferies** of East Walk, Croydon Road, Reigate, writes:

After using my ZX81 for seven months I am having difficulty in switching from 'K' cursor to 'P' cursor. With the Shift key depressed, pressure on New line does not immediately produce the Function cursor. Is there any simple solution?

I was thinking of buying a Kermpton keyboard. Will this solve the problem, or will it be a waste of money, if the touch sensitive system is faulty?

I have a big stick on my ZX81 'New line won. Roll the finger over the key to make contact.' As your machine is within the guarantee period, in theory you should send it back. If you do, test it as soon as Sinclair return it to you. If there is no improvement send it back on the same day, with a stiff covering letter.

Some people who have had experience of the Sinclair returns department would advise you very strongly against doing this if you want to see your machine back in anything like a reasonable time.

There is not a lot of evidence of ZX81 keyboards giving out, so this case should be seen in isolation. If the keyboard is at fault, then another keyboard should bypass the problem.

The only exception would be if one of the diodes had become damaged in some way, preventing it from discharging power at the right time. This is however very unlikely.

## EACH ONE TO HIS TASTE

**Michael Andrews** of South East London, writes:

I have just been given a Texas Instruments 99/4 computer for a birthday present. Could you please tell me if there are any books or magazines

published for this computer, or if there is a user's club? It seems that it is not a very popular computer and does not have much support.

I do not know about horses, but perhaps you are looking a gift computer a little in the mouth. Think of all those BBC and Sinclair customers who have been waiting literally months for computers that still have not been delivered. While the TI 99/4 might not be well supported, it is not without admirers. It has a home users group who should be able to give you the sort of information you need. Write to Paul Dicks, TIHOME, 107 Bedford Road, Morden, Surrey.

## COMMANDING PROBLEMS

**Stephen Clements** of Hophurst Drive, Crawley Down, West Sussex, writes:

I am writing to ask if you could help me out with a problem I have been agonising over for the past few weeks. I have been converting programs for the ZX81 to be used on my Vic, but I have come face to face with a line Print at x,y; which I do not know how to convert. Can you help me?

One of the major disadvantages of the ZX81 is that it does not have a memory mapped screen. Therefore you cannot Poke characters on to the display, though you can use the Print at command. Print at x,y; "\*" would mean that at line x, column y, the character \* would appear.

But the ZX81 can Print at more screen locations than the Vic20 can Poke. This is because the ZX81 uses a 22 line x 32 column grid, whereas the Vic uses a 24 line x 22 column grid.

The control of characters will have to be different, because a location defined by a Print at command is not mapped into a specific place in the memory. Such a location will float in the Ram, without a permanent address that can be Peaked or Poked.

Horizontal locations are determined by adding or subtracting from y, while vertical locations are determined by adding or subtracting from x. A simple routine to show this would be:

```
10 LET X=19
20 LET Y=19
30 PRINT AT X,Y,":"
40 IF NOT INKEY$=" " THEN PRINT
   AT X,Y,":"
50 SPACE
60 IF INKEY$="S" THEN LET
   Y=Y-1
70 IF INKEY$="E" THEN LET
   X=X+1
80 IF INKEY$="T" THEN LET
   X=X-1
90 IF INKEY$="D" THEN LET
   Y=Y+1
99 GOTO 30
```

## PACKAGING MEMORIES

**M Ellick** of Buriton Close, Bristol, writes:

I have a ZX81 with a 64K Ram Pack fitted. In a letter in your July 1 issue, you mention that the ZX Microdrive will probably be able to be used with other computers, like the ZX printer. Do you think that an adaptor will be needed to use the Microdrive with the ZX81?

Until someone actually sees the Microdrive we cannot be sure how easy it will be to use with the ZX81. However, the ZX81 does not have the disc control commands in its Rom, so some sort of extra control will be necessary. My guess is that this will take the form of an Eprom accessible by Poke commands. This means that you will have to switch out another block of your memory pack to make way for the Eprom. But, this would still allow you to write a 48K program, with a database stored on the Microdrive.

## SWITCHING BLACK AND WHITE

**Imtiaz Mirza** of Priory Avenue, High Wycombe, Buckinghamshire, writes:

I read in PCW July 8 that it was not possible to modify the ZX81 hardware to change the black characters on a white background in white

characters on a black background. You said that this was only possible on the ZX80. Could you please advise me on how to do this?

The modification on the ZX81 to give inverse video is a simple wiring job. On the underside of the PCB are three letters A, B and C. Normally, the track runs from A to C. A simple wire bridge between A and B, instead of A and C, will do the job. If you want to get really clever, you could always wire in a switch, so that you could change between an ordinary and inverse display.

**D Fritsch**, of 6 Stanton Road, Felwall, Warrington, Cheshire WA4 2HS, makes an add on that will give you an inverse display on the ZX81.

## HOODWINKING KEYWORD MEMORY

**Alan Haigood** of Fulham, London, writes:

I know that if I want to use a keyword on my Vic20, I can enter it by using the first letter, followed by the second letter shifted. What I would like to know is why this is so?

This useful feature on the Vic is due to the operating system which uses text compression. All the keywords on a Vic are stored as a number between 0 and 255. If you write Input to the screen, it will be stored there as five bytes, and will therefore take up five bytes of screen memory. But it will leave the buffer as a single byte with a decimal value of 132. Whatever the number of bytes of screen memory the keyword takes, it will still only be stored as a single byte.

When you use an I Shift N for Input you are fooling the computer into thinking that you have entered the full command. This only uses two bytes of screen memory. If you List the instruction, it will come up as Input, because the process is reversed as information comes back to the screen out of the buffer.



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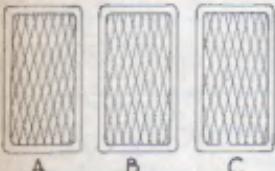
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# Competitions

## Finding the lady



Three playing cards are placed face down on a table. The total value of A and B is 15. The total value of B and C is 17. No card is a seven or has a value higher than 9. Identify the cards.

This problem can be solved using a simple program:

```

18 FOR A = 1 TO 9
20 LET B = 15 - A
30 LET C = 17 - B
40 IF A = 7 OR A > 9 OR B = 7 OR B > 9 OR C < 7
    OR C > 9 THEN GOTO 80
50 PRINT "A = "; A; "B = "; B; "C = "; C
60 NEXT A

```

Even without a computer this is not a difficult problem, but the same approach will apply to more complex problems.

Now try this card trick. Deal 20 cards off a shuffled pack and ask a friend to insert the cards back into the pack, but the other way up from the rest of the pack (face up rather than face down). Shuffle the pack and get your friend to count off the top 20 cards, straightening the pile so that you cannot see which way they face. Ask

your friend to note, without telling you, the number of cards face-up in the remaining 32 cards.

Hold the 20 cards behind your back and — by thought transference — you will be able to turn individual cards over so that the number of cards face-up in your part of the pack is the same as the number face-up in your friend's 32 cards.

When the two piles of cards are investigated, they will be found to have the same number of cards face-up.

How is it done? When you hold the cards behind your back you simply turn them over.

The whole pack contains 52 cards, of which 20 have been turned over. If your friend has a number of cards,  $p$ , turned over in his pile of 32 cards then you have  $20 - p$  reversed cards in yours. Since there are 20 cards in all in your pile then you must have  $p$  cards face down. Turn the whole pile over and you have the same number of cards face-up as your friend.

shuffling until the pack is brought back to its order at the start.

How many times must the shuffle be performed if (a) a standard deck of 52 cards is used and (b) if the jokers are added to make a pack of 54 cards?

### Solution to Puzzle No 17

First find the length of the sides of a non right-angled triangle where the area is 180 sq miles and the sides are exact numbers of miles in length. This can be done using a program similar to the one below.

```

10 LET L = 19
20 FOR A = L - 9 TO L
30 FOR B = 2 TO A - 1
40 FOR C = (A - B) + 1 TO B - 1
50 LET S = (A + B + C) / 2
60 LET T = SQR (S * (S - A) * (S - B) * (S - C))
70 IF ABS (T - 180) < 0.0000001 AND B + B + C + C < > A + A THEN GOTO 200
80 NEXT C
90 NEXT B
100 NEXT A
110 LET L = L + 10
120 GOTO 20
130 PRINT A; ":"; B; ":"; C
210 STOP

```

This gives the sides as 37, 30 and 13 miles. The catch was in the words "the morning's total divided by half" — meaning multiplied by two. In this case the distance from A to B could only be 13 miles — covered in the morning — with 26 miles covered in the afternoon. With a total round trip of 80 miles, this leaves 41 miles still to be travelled to finish the journey.

### Winner of Puzzle No 17

The winner is F M Hill, Westcott Close, Frome, Somerset who receives £10.

## ARTHUR MEETS A FOREIGNER, CALLED ALAN OG

YOU ARE SO ABSOLUTE, ARTHUR, IN THE END  
IT'S YES OR NO, IT'S EITHER FALSE OR TRUE,  
WHO'S NOT YOUR ENEMY MUST BE YOUR FRIEND,  
IT ALL COMES DOWN TO BAY OR OFF WITH YOU.

NOW LOOK AT ME, I ROSE AND FALL, RECEDDE,  
APPROACH APPROPRIATE AND MERGE, I USE  
MY JUGEMENT, DIVE, FLOW, FOLLOW, VARY SPEED.  
I NEVER JUMP, RESTRICT, EXCLUDE, OR WHOOSE.

AND MOVERS LOVE ME, I'M LIKE ONE OF THEM.  
I ASK NO QUESTIONS, SO THEY TELL NO LIES.  
SOMETHING THEY'LL FORGET, THEY MAKE ME WHAT I AM.

THEY HATE YOU, ARTHUR, FACE THE FACT THEY HATE YOU.

YES, THEY ADMIRE YOU: YOU CAN ANALYSE.  
BUT ME, I HOLD THE MIRROR UP TO NATURE.

## ARTHUR

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#### Hardware

##### Processor/Memory

Z80A running at 3.25 MHz.  
8K bytes ROM 3K bytes RAM.

#### Input

40 moving-key keyboard with auto-repeat on every key.

#### Output

Memory-mapped 32 x 24 character display with high resolution user graphics. Output to drive normal UHF TV set on channel 38.

#### Sound

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#### Cassette

Load Save & Verify at 1500 baud, separate data storage.

#### Software, FORTH

##### Data Structures

Integer, Floating point and String data may be held as constants, variables or arrays with multiple dimensions and mixed data types.

##### Control Structures

IF-THEN-ELSE, DO-LOOP, BEGIN- WHILE-REPEAT, BEGIN-UNTIL, all may be mixed and nested to any depth.

##### Operators

Mathematical +, -, X, ÷,  
Logical AND, OR, NOT,  
XOR.

Comparison <, >, =.

##### Program Editing

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